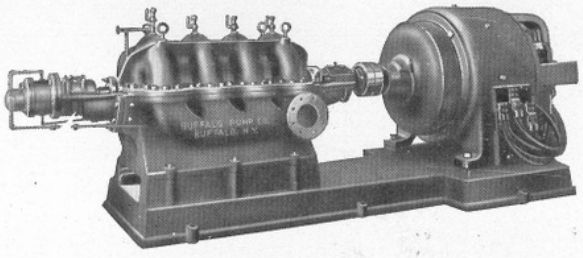
BUFFALO

Double Suction Impeller Multistage Centrifugal Pumps



CLASS "RDS"

Bulletin No. 952 A

Buffalo Steam Pump Co.

Buffalo, N. Y.

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Boston
Philadelphia
Pittsburgh

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Minneapolis
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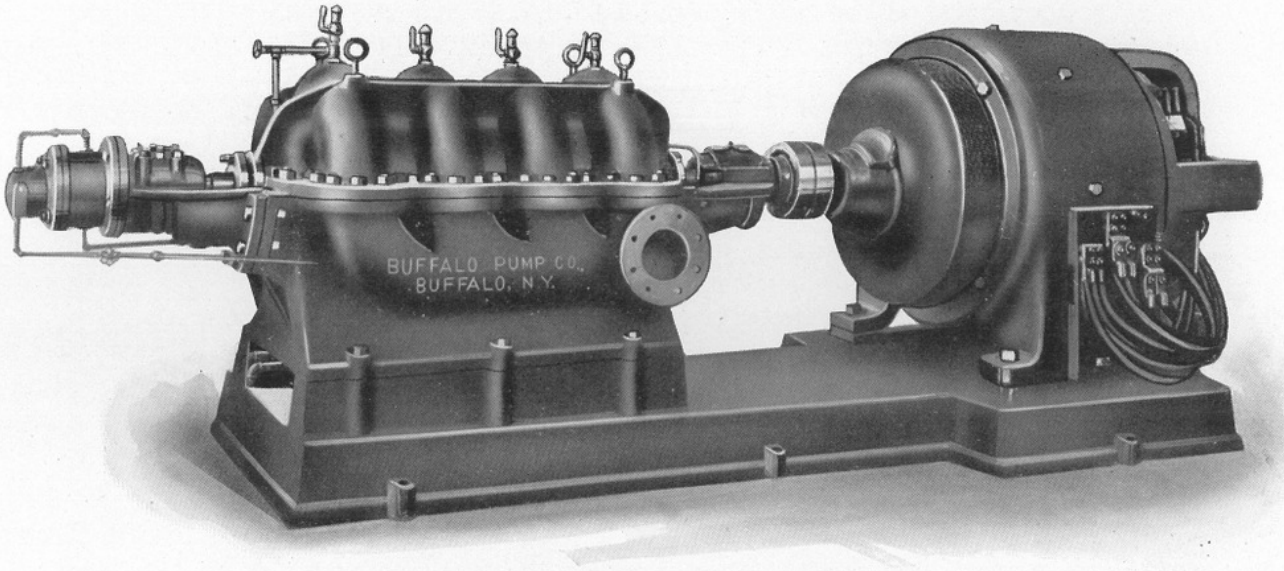


Fig. 1247

4 Stage Class "RDS"---Motor Driven

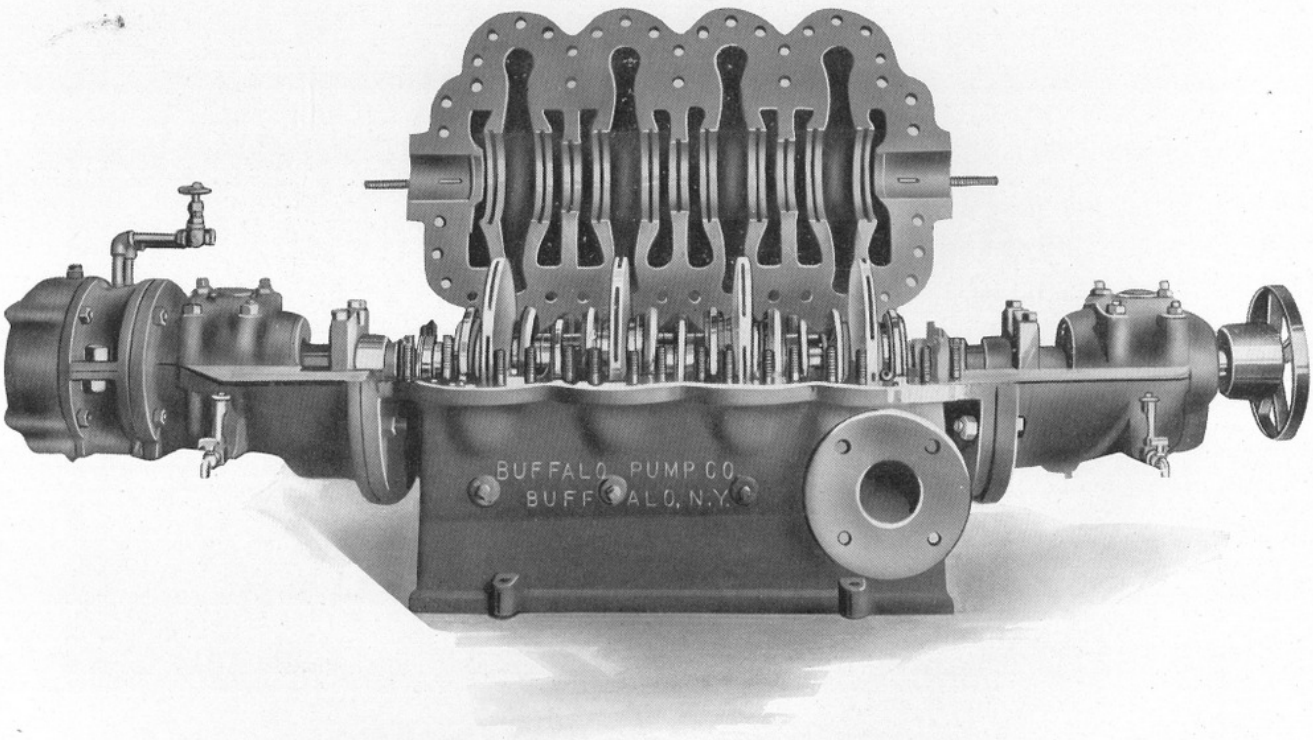


Fig. 1245

4 Stage Class "RDS"---Cover Raised

Buffalo Class "RDS" Multi-Stage Centrifugal Pumps

"BUFFALO" Class "RDS" Multi-stage double suction impeller centrifugal pumps are a special development of all the best features in pump design, selected during our long experience as pump manufacturers, and are designed and built to meet the requirements of the most exacting service.

These pumps are being used by large manufacturing concerns, public service corporations, city water works, and the United States Government. We particularly commend their investigation by discriminating engineers and users requiring pumps for Public Water Supply, Municipal and Private Fire Service, Boiler Feeding, Mill and Factory Water Supply, or any other service where thorough reliability and high efficiency are important considerations.

The "Buffalo" Class "RDS" pump is of the horizontal shaft "double suction" impeller multi-stage type, with horizontally divided casing—and is built in two, three or four stages, to suit prescribed conditions.

These pumps are offered for capacities up to 2000 U. S. Gallons per minute. The standard pumps are built for 250 lbs. per square inch maximum working pressure and all standard pumps are strong enough to withstand this pressure with a large factor of safety. Special extra heavy pumps can also be furnished for maximum working pressures up to 400 lbs. per square inch.

The Class "RDS" pumps are especially designed for direct connection to standard high speed and moderate speed electric motors and steam turbines. They are also adaptable for pulley drive.

CASING:

The casing is the horizontally divided type, the suction and discharge nozzles being cast in the lower half, permitting the removal of the upper half so the interior parts can be inspected or removed without disturbing the pipe connections.

The suction and discharge nozzles are located on opposite sides of the pump casing and pumps may be arranged for either right or left hand rotation. The casing has machined joints, and flanges are secured together with heavy bolts.

The construction of the water passages throughout is of the "double suction volute" type, and because of this special construction the pump, when in operation, is in perfect hydraulic balance under all conditions of head and pressure. The water passages are simply formed and of ample areas to avoid friction losses and sudden changes of velocity.

The water enters each stage through a "double suction volute" chamber, formed to maintain a practically constant velocity at all points of the impeller inlets. After passing through the impeller the water is delivered into a discharge volute which is also formed to maintain constant velocity of flow and from which the water is discharged into a pressure chamber, which forms the water channel leading to the next impeller. This pressure chamber is formed so that the velocity of water passing through it is gradually decreased up to the center of the passage and from there is again increased to the proper velocity for entrance to the next impeller. This permits of conversion of velocity into pressure, between each two stages, with the least possible loss due to shock and friction. Another important feature of our suction and discharge volute design is that the direction of flow or "whirl" is not changed from the time the water enters the first suction volute until it is discharged from the discharge volute of the last stage. This is a valuable improvement in that it eliminates the energy required to change the direction of flow of a column of water moving at high velocity.

IMPELLERS:

The impellers are the enclosed "double suction" hydraulically balanced type, the water entering the impellers at opposite sides in equal volume and pressure; thereby securing the perfect

hydraulic balance previously referred to. Each impeller individually and the entire series of impellers as a whole are therefore in hydraulic balance under all conditions of operation.

While this construction ensures perfect hydraulic balance under operating conditions we equip each pump with a marine type thrust bearing. This maintains the impellers in a central position in the casing when starting the pump, and takes up thrust if one impeller becomes obstructed with foreign matter.

The impellers of standard pumps are made of hard, close grained cast iron. For boiler feeding where hot water is handled and for some other special services, we recommend that pumps be fitted with brass or bronze impellers.

The impellers are very carefully machined and hand dressed to ensure smooth surfaces and perfect rotary balance. Each impeller is tested separately for rotary balance, and after mounting, the entire rotor, including impellers, shaft, keys and coupling is placed in perfect rotary balance. The shaft is enlarged in diameter where the impellers are mounted on it.

SHAFT:

The shaft is made of high grade open hearth steel machined all over, and the impellers are mounted on an enlargement of diameter at about the center of the shaft and secured by means of steel feather keys. Each impeller is secured by its individual key and the keyways are spaced radially around the shaft so as to maintain its strength to the fullest extent.

The shaft has a shoulder turned in place to locate the first impeller mounted thereon; between each pair of impeller hubs the shaft is protected by a bronze sleeve with flanged ends which acts as a guide for the water entering the impellers and also completely covers the ends of the feather keys. At each end of the impeller equipment there is provided a bronze covering nut, threaded on the shaft, which permits of a slight adjustment endwise in assembling the pump and also forms a protecting cover for the outer ends of feather keys and the joints between the shaft and the outer shaft sleeves. These sleeves are made of bronze tubing and are extended from under the impeller nuts to beyond the stuffing box glands at each side of the pump. Sleeves are forced on the shaft under hydraulic pressure.

CLEARANCE RINGS:

The clearance rings are the flat surface floating type, made of bronze and carefully machined all over. These rings are located around the suction openings of each impeller and surrounding

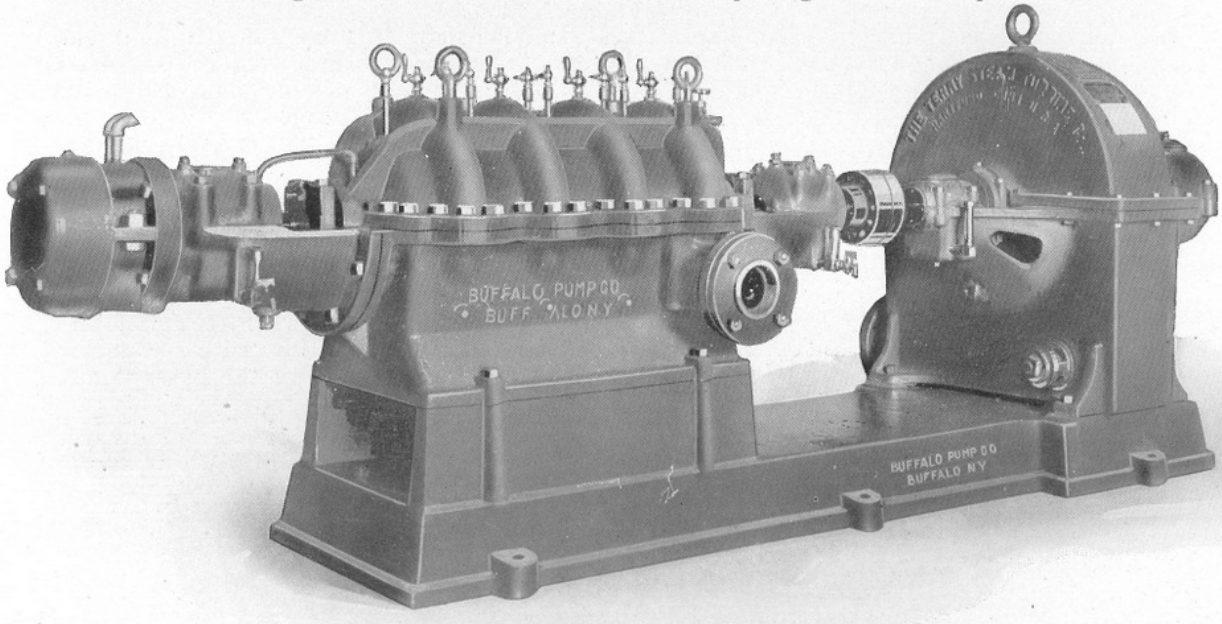


Fig. 1246
4 Stage Class "RDS"---Steam Turbine Driven

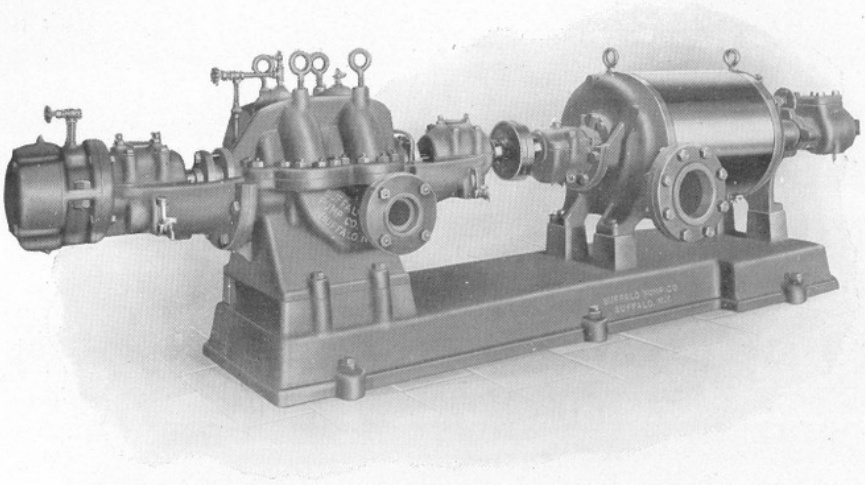


Fig. 1248
2 Stage Class "RDS"---Steam Turbine Driven

the shaft between each two stages. They are the "L" section type ensuring strength without undue weight, and are arranged so that they are held in position by the difference in pressure between the stages, thus ensuring a tight joint between the stages, and this also prevents them from turning with the impellers. This arrangement eliminates friction and leakage.

SHAFT BEARINGS:

Pump bearings are located at each end of the casing and consist of heavy cast iron bracket housings with flanges bolted to the pump casing and centered in turned and bored fittings.

The bracket forms a drip pocket and support for the horizontally split bearing shell which consists of a cast iron jacket, turned on the outside and fitted to a bored seat in the bracket. The bearing shells are horizontally split and lined with high grade babbitt metal of ample thickness, peined, bored and scraped to a perfect fit with the shaft.

The bracket is provided with an ample oil reservoir and the bearings are lubricated by means of brass oil rings, suitable provision being made for returning oil to the reservoir after passing through the bearing; also for filling and draining. Each bearing is provided with a brass cased sight oil gauge.

THRUST BEARING:

Thrust bearing is the multiple collar marine type, and consists of a horizontally split and babbitted housing with flange, bolted to the outer end of outer pump bearing. The thrust collars are machine steel turned from a solid forging, bored to fit over the outer end of pump shaft, and secured by feather key and nut. The thrust bearing is provided with an oil chamber connected by a channel with the outer pump bearing, and a copious supply of oil is circulated over the thrust collars at all times by means of a small brass oil wheel revolving in the oil chamber and feeding the oil through suitable circulating passages.

The housing and end thrust cover are provided with water jacket arranged to permit a proper circulation of cooling water to maintain the oil at a proper temperature for lubrication.

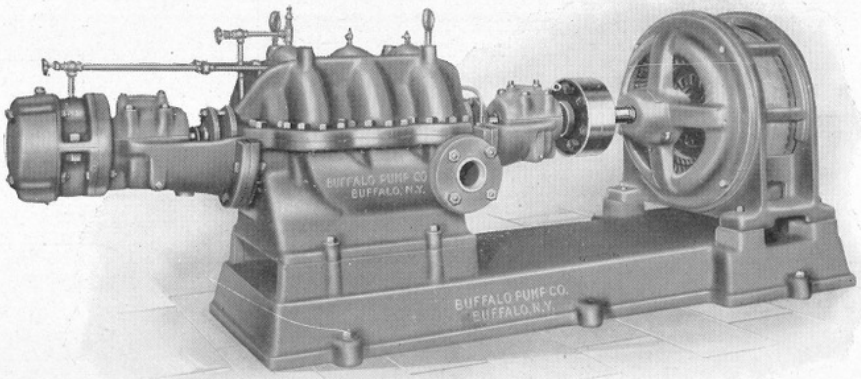


Fig. 1249
3 Stage Class "RDS"---Motor Driven

GLANDS:

Stuffing boxes are cast in each end of the pump casing. They are deep and provide for an ample amount of packing. The throats are fitted with brass bushings.

Packing glands are cast iron with brass bushings and circular flange secured to the stuffing box flange with three large studs and adjusting nuts.

WATER SEALS:

Water seals are provided at each stuffing box, these consisting of brass cage rings with suitable circulating holes. On the suction end, the water seal is provided with water supply connection to prevent air from entering the pump. On the discharge end the water seal is provided with a small release pipe which relieves the discharge pressure from the outer rings of packing which do not require forcing up to prevent leakage. Thereby a cool running packing is provided.

COUPLING:

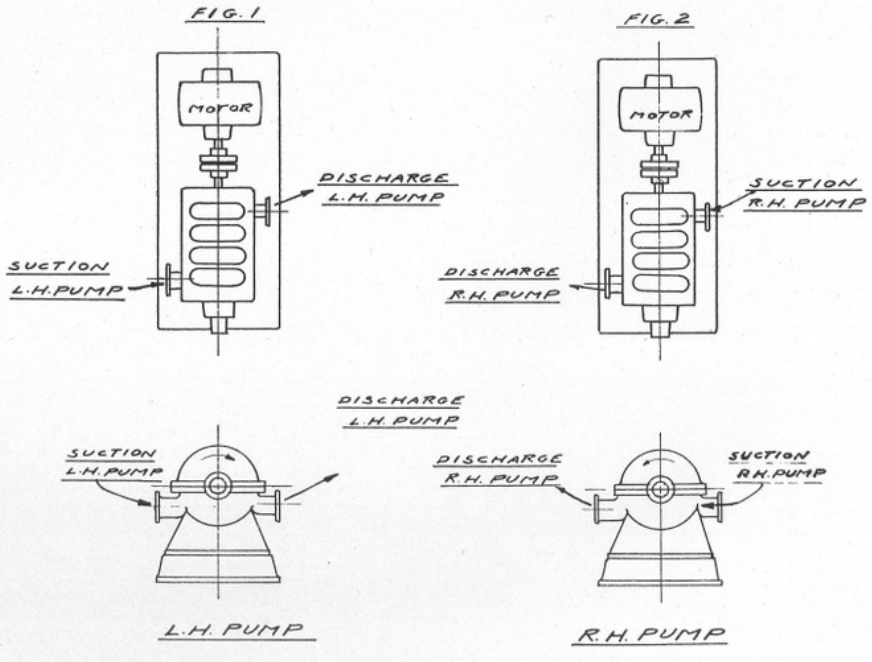
Shaft coupling is the flexible type. On the small sizes, 2" and 2½", the flanges are connected together with a sole leather plate, having heavy leather segments securely riveted to the plate, and which fit into corresponding openings in the coupling flanges. All other sizes are equipped with couplings of the steel pin and rubber bushing type. In all cases the couplings are of ample strength to carry maximum loads required and are carefully machined and in rotary balance.

SUB-BASE:

Sub-base is cast iron of very substantial construction, suitably ribbed, and provided with heavy lugs cast on the outside for foundation bolts.

Ample machine finished pads are provided on the top of sub-base for mounting and bolting the pump and motor or turbine. In case of pulley driven pumps the sub-base is as just described, except it is made with machined pads for mounting pedestal bearings. Pulley driven pumps of the smaller sizes are furnished with the pump shaft extended through the driving pulley and one outboard ring-oiling pedestal bearing. The larger size pumps are provided with a flexible coupling and the driving pulley mounted on a separate length of open hearth steel shaft carried in two outboard ring oiling pedestal bearings. The pedestal bearings are of heavy cast iron construction, the bearing and lubricating equipment being similar to that used in the main pump bearings.

Pulleys are heavy cast iron in one piece, carefully machined and balanced and mounted on shaft with feather key.



Line Drawing Showing Right Hand (RH) and Left Hand (LH) Class "RDS" Pumps.

BUFFALO CLASS "RDS" DOUBLE SUCTION MULTISTAGE CENTRIFUGAL PUMPS

SPECIFICATIONS

CASING: Cast iron, divided on horizontal center line. Suction and discharge openings cast in lower half, allowing interior parts to be inspected or removed without breaking pipe connections.

IMPELLERS: Cast iron, bronze on special order. Enclosed double suction hydraulically balanced type. Each impeller and entire series are in perfect hydraulic balance when pump is in operation. Mounted on shaft by feather keys and lock nuts.

CLEARANCE RINGS: Bronze "L" section, floating type. Located around suction openings of each impeller, and surrounding the shaft between each two stages. Will not turn with impellers. Prevent leakage and eliminate friction.

SHAFT BEARINGS: Horizontally divided shell type. Shells are horizontally split and lined with high grade babbitt, peined, bored and scraped. Ring oiling. Bearings are located at each end of pump casing.

THRUST BEARING: Multiple collar marine type. Horizontally split housing, babbitted. Thrust collars machine steel turned from a solid forging. Housing water jacketed. Oil circulated continuously over thrust collars.

GLANDS: Cast iron, brass bushed.

WATER SEALS: Brass cage rings with suitable circulating holes. Provided at each stuffing box. Seal on suction end has water supply connection.

SHAFT: Open hearth steel, machined all over. Enlarged at center where impellers are mounted, and secured by keys. Brass covered where exposed in pump and glands.

SUB-BASE: Cast iron, ribbed and stiffened. Heavy lugs cast on outside for foundation bolts. Pads cast on top for motor or turbine feet or for pedestal bearings if pulley driven.

COUPLING: Flexible type.

PULLEY: Cast iron, one piece. Pedestal bearings cast iron. with bearings similar to main pump bearings.

FITTINGS: Drain and air cocks. Piping for water jacket on thrust bearing and for water seal.

FINISH: Painted, filled and rubbed down outside with final finishing coat. Bright parts exposed to weather protected by a slushing compound.

Code Word Standard Pulley Driven Pump	Figure Number	Size of Pump, Inches	Pipe Sizes, Inches		Capacity, Gallons per Minute		Size Pulley, Inches		Approximate Floor Space, Inches
			Suction	Discharge	Normal	Maximum	Diameter	Face	
TWO STAGE									
RSADM	1248	2	2½	2	100	140	6	5	87x25
RSBER	1248	2½	3	2½	150	225	7	6	87x25
RSCUB	1248	3	4	3	225	325	8	8	92x27
RSDIL	1248	4	5	4	400	550	10	10	111x31
RSEFX	1248	5A	6	5	620	750	10	12	111x31
RSFAD	1248	5B	6	5	620	850	10	12	116x38
RSFYK	1248	6	8	6	900	1300	12	16	120x38
RSFZP	1248	8	10	8	1600	2000	13	16	130x43
THREE STAGE									
RSGND	1249	2	2½	2	100	140	On Application	On Application	94x25
RSHFZ	1249	2½	3	2½	150	225			94x25
RSJEQ	1249	3	4	3	225	325			99x27
RSKAP	1249	4	5	4	400	550			120x31
RSLOX	1249	5A	6	5	620	750			120x31
RSLVQ	1249	5B	6	5	620	850			127x38
RSMIT	1249	6	8	6	900	1300			131x38
RSMUX	1249	8	10	8	1600	2000			143x43
FOUR STAGE									
RSNUC	1250	2	2½	2	100	140	On Application	On Application	100x25
RSOBY	1250	2½	3	2½	150	225			100x25
RSPAL	1250	3	4	3	225	325			106x27
RSQEF	1250	4	5	4	400	550			129x31
RSTIZ	1250	5A	6	5	620	750			129x31
RSTWD	1250	5B	6	5	620	850			138x38
RSWOL	1250	6	8	6	900	1300			142x38
RSWRV	1250	8	10	8	1600	2000			155x43

Add Code Word JCESF for Brass Runners. Add Code Word JCHBY for Brass Glands.
Add Code Word JCXRS For Motor Base and Flexible Coupling.

NOTE: Brass Runners are recommended for 2 in. and 2½ in. Pumps, and are necessary on these sizes when speed is 2200 R. P. M. or over.

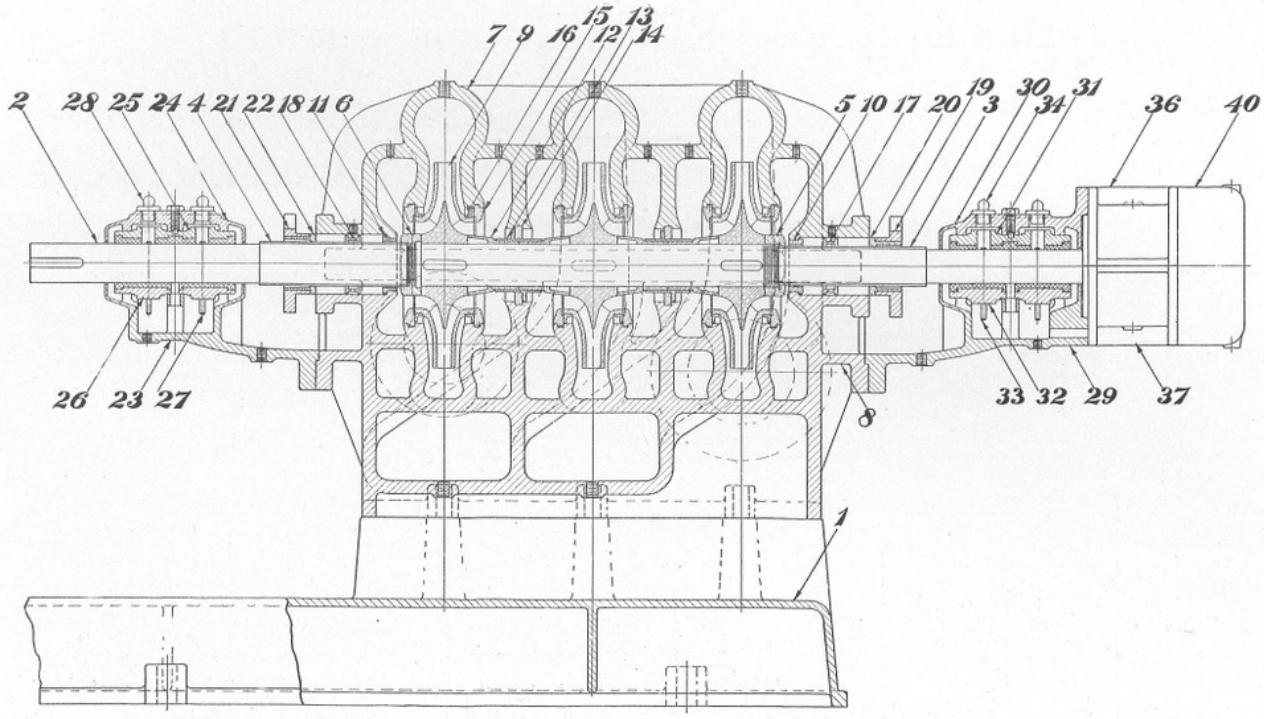


Fig 1240

3 Stage Class "RDS"---Sectional View

No.	Name	Remarks
1.	Sub-base	
2.	Shaft	
3.	Shaft Sleeve	Outer
4.	" "	Outer
5.	Impeller Nut	Inner
6.	" "	Inner
7.	Casing	Top Half
8.	"	Bottob Half
9.	Impeller	
10.	Stuff Box Bushing	Outer
11.	" " "	Inner
12.	Distance Bushing	
13.	Floating Clearance Ring	
14.	Plate.	
15.	"	
16.	Floating Clearance Ring	
17.	Water Seal	Outer
18.	" "	Inner
19.	Gland	Outer
20.	" Bushing	"
21.	Gland	Inner
22.	" Bushing	"
23.	Bearing Bracket	"
24.	" Cap	"
25.	Bearing Bushing	Upper
26.	" Bushing	Lower
27.	Oil Ring	For Inner Bearing
28.	" Cover	" " "
29.	Bearing Bracket	Outer
30.	" Cap	"
31.	" Bushing	Upper
32.	" "	Lower
33.	Oil Ring	For Outer Bearing
34.	" Cover	" " "
35.	Sight Oil Gauge	Not Shown

No.	Name	Remarks
23.	Bearing Bracket	Inner
24.	" Cap	"
25.	" Bushing	Upper
26.	" "	Lower
27.	Oil Ring	For Inner Bearing
28.	" Cover	" " "
29.	Bearing Bracket	Outer
30.	" Cap	"
31.	" Bushing	Upper
32.	" "	Lower
33.	Oil Ring	For Outer Bearing
34.	" Cover	" " "
35.	Sight Oil Gauge	Not Shown

No.	Name	Remarks
36.	Thrust Housing	Upper [Sometimes ma le in one piece.
37.	" "	Lower]
38.	" Bushing	Upper [Not furnish-
39.	" "	Lower ed with two piece hous'g.]
40.	" Cover	
41.	" Collar	
42.	Oil Runner	
43.	Flexible Coupling	Driving Half
44.	" "	Driven "
45.	Coupling Pins	
46.	" Bushings	

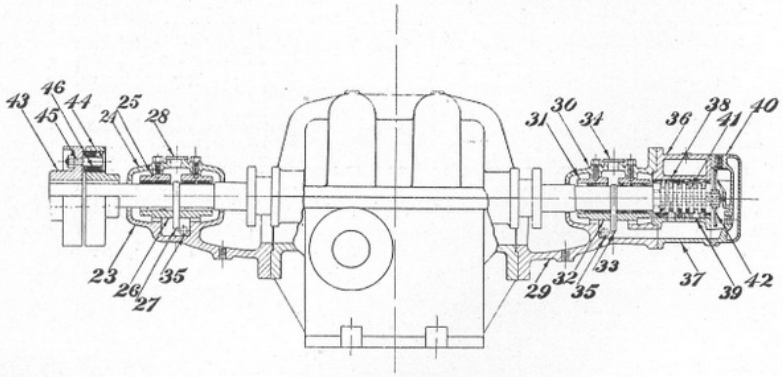
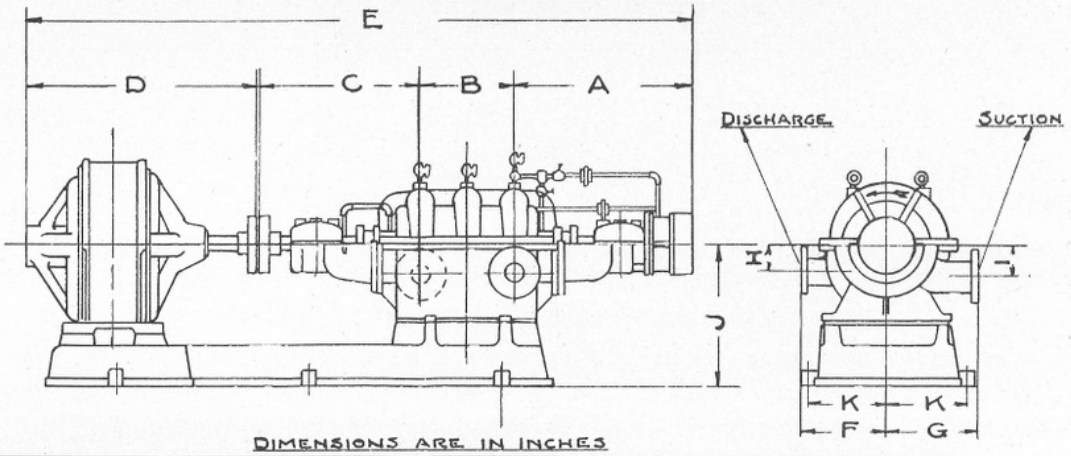


Fig. 1241

Class "RDS" Bearings and Coupling---Sectional View

Buffalo Class "RDS" Double Suction Multistage Centrifugal Pumps

DIMENSION TABLE



DIMENSIONS ARE IN INCHES

SIZE OF PUMP.	DIAM SUCTION	FLANGE DIAM	DIAM BOLT CIRCLE	Nº OF BOLTS	SIZE OF BOLTS	DIAM DISCHARGE	FLANGE DIAM	DIAM BOLT CIRCLE	Nº OF BOLTS	SIZE OF BOLTS	A	B 2. STAGE	B 3. STAGE	B 4. STAGE	C	D	E	F	G	H	I	J	K
2	2½	7	5½	4	⅝	2	6½	5	4	⅝	25¼	6½	13	19½	22¼	VARIES WITH LENGTH OF MOTOR	"	12½	12	3½	4½	19½	11
2½	3	7½	6	4	⅝	2½	7½	5⅞	4	¾	25¼	6½	13	19½	22¼		"	12½	12	3½	4½	19½	11
3	4	9	7½	8	⅝	3	8¼	6⅝	8	¾	26⅛	7½	14	21½	23		"	14	12½	4¼	5	21¼	17
4	5	10	8½	8	¾	4	10	7⅞	8	¾	31⅝	9	18	27	28		"	16	15	5½	6½	25	17
5A	6	11	9½	8	¾	5	11	9¼	8	¾	31⅝	9	18	27	28		"	16	15	5½	6½	25	17
5B	6	11	9½	8	¾	5	11	9¼	8	¾	32⅞	11	22	33	28⅞		"	20	18	6	8	33	18½
6	8	13½	11¾	8	¾	6	12½	10⅝	12	¾	32⅞	11	22	33	30¾		"	20	18	6	8	33	18½
8	10	16	14¼	12	⅞	8	15	13	12	⅞	37½	12½	25	37½	32		"	23	20	8	10½	32	23

Dimensions D and E vary with size of Motor or Turbine being used.

Certified Foundation Dimension Prints are furnished on all orders.

Foundation Bolts are not furnished except on special order.

SPEED LIMITS OF BUFFALO CLASS "RDS" DOUBLE SUCTION MULTISTAGE PUMPS

250 Lbs. Maximum Working Pressure

Built in Two, Three and Four Stages

Size of of Pump, Inches	Normal Capacity, Gallons per Minute	Speed	80′	90′	100′	110′	120′	130′	140′	150′	160′	170′	180′
2	100	Min.	1450	1575	1675	1775	1850	1925	2000	2075	2125	2160	2200
		Max.	3400	3550	3700	3850	4000	4000	4000	4000	4000	4000	4000
2½	155	Min.	1600	1735	1840	1950	2035	2115	2200	2280	2385	2375	2420
		Max.	3700	3900	4000	4000	4000	4000	4000	4000	4000	4000	4000
3	225	Min.	1360	1480	1570	1660	1740	1810	1880	1940	1990	2020	2035
		Max.	3200	3365	3495	3625	3750	3750	3750	3750	3750	3750	3750
4	400	Min.	1250	1370	1455	1540	1615	1680	1740	1800	1850	1870	1885
		Max.	2525	2680	2785	2885	3000	3000	3000	3000	3000	3000	3000
5A	620	Min.	1325	1450	1525	1625	1700	1775	1825	1900	1950	1975	2000
		Max.	2650	2800	2900	3000	3000	3000	3000	3000	3000	3000	3000
5B	620	Min.	1025	1125	1200	1250	1300	1350	1400	1475	1500	1525	1550
		Max.	2050	2150	2275	2400	2500	2600	2600	2600	2600	2600	2600
6	900	Min.	1070	1175	1250	1325	1385	1440	1490	1540	1575	1600	1625
		Max.	2150	2275	2390	2500	2600	2600	2600	2600	2600	2600	2600
8	1600	Min.	1000	1090	1170	1245	1300	1345	1390	1430	1470	1500	1525
		Max.	1800	1900	2000	2100	2200	2200	2200	2200	2200	2200	2200

Note! These speeds are for one stage; for heads higher than shown on this table, divide the total head equally into two or more stages as required and apply speed per stage as above

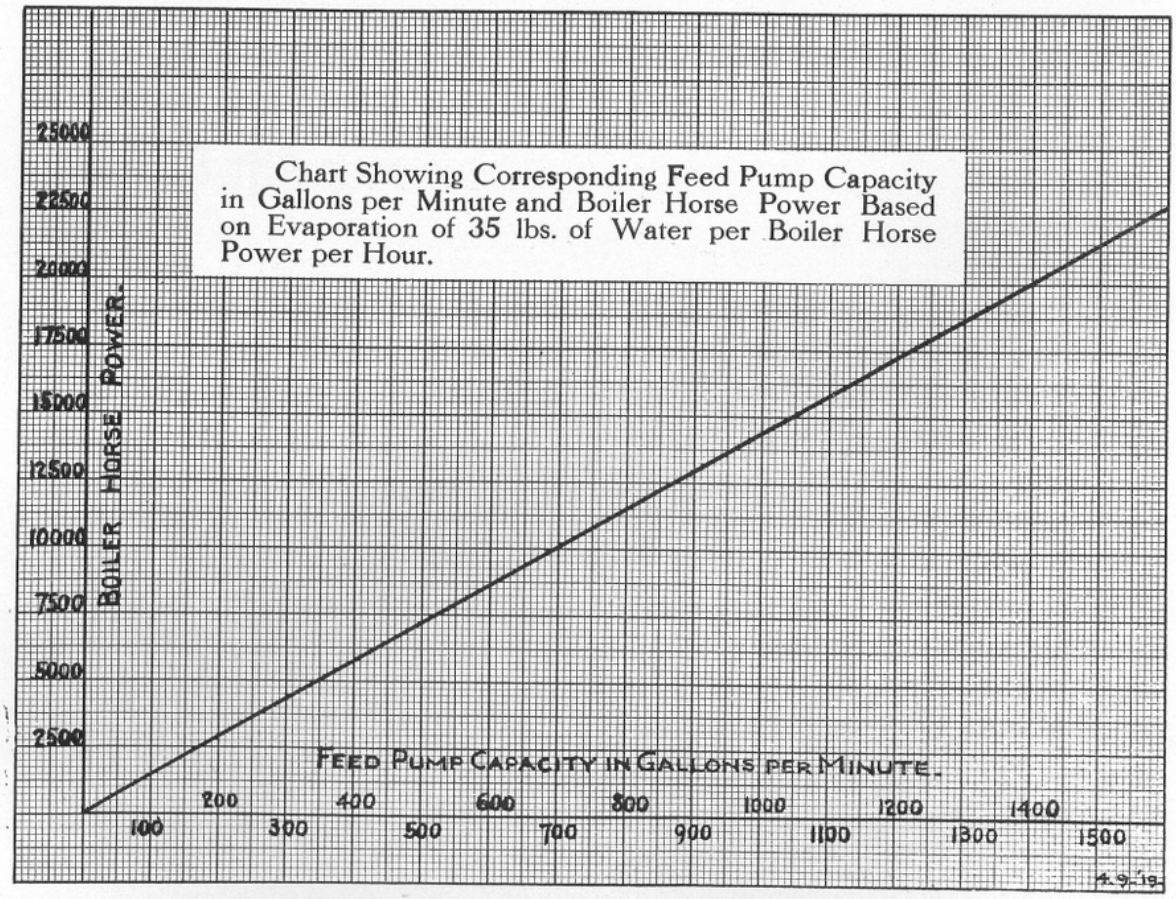


Fig. 1214
Pump Capacities for Various Boiler Horse Power

If Boiler Horse Power at Peak Loads exceeds boiler rating, pump capacity must be increased accordingly.

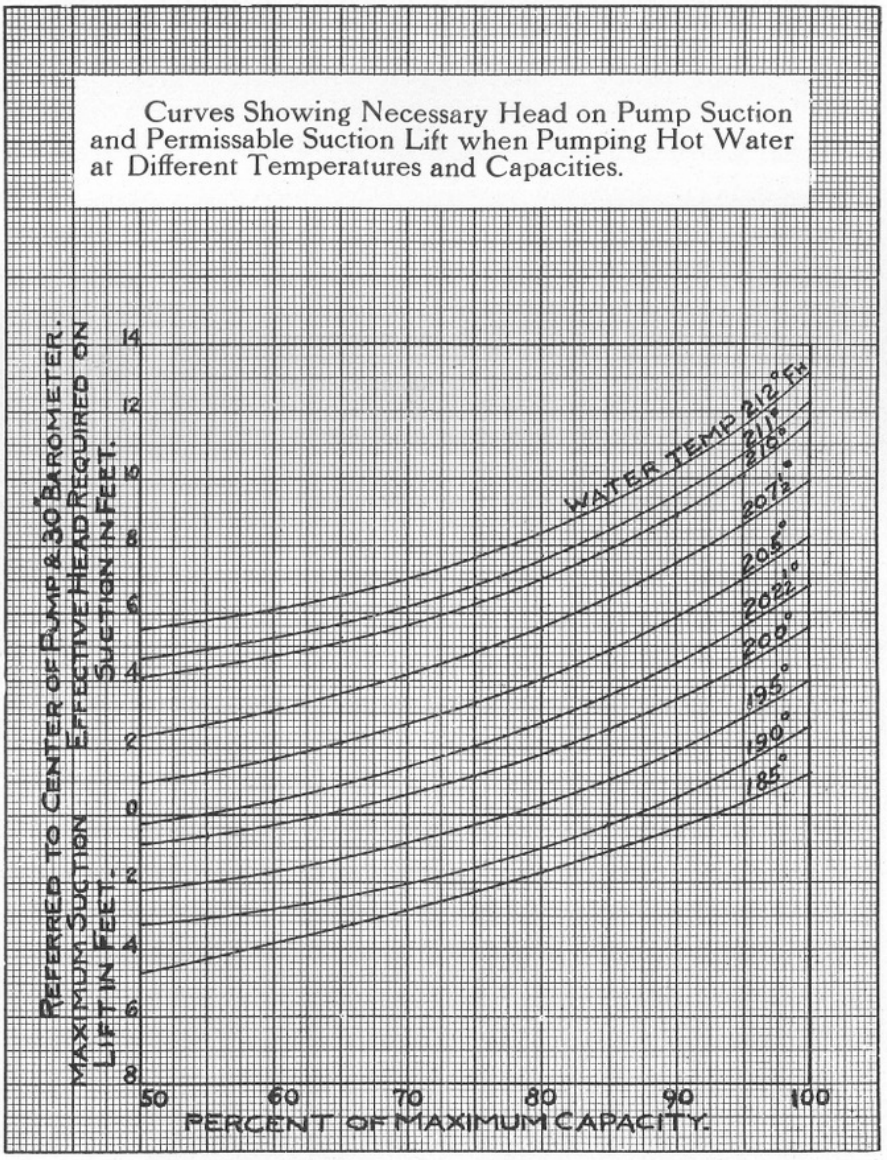


Fig. 1220

Head on Suction Necessary When Handling Hot Water

In all cases of boiler feeding or of pumping hot water for any service, water must flow to the pump suction under a positive head, sufficient to overcome the suction pull and pipe friction, and also to prevent vapor from forming in the pump casing.

It has been determined from experiments and from actual operation that a definite relationship exists between the temperature of the water, the effective head on the pump suction, and the capacity of the pump. The chart, Fig. 1220, shows the effective head necessary to obtain pump capacities from 50% to 100% of the maximum cold water capacity of the pump. Maximum cold water capacity ratings are given on page 7.

Effective head should be measured above the center line of the pump. Pipe connection between the pump suction and heater should be of ample size and as straight and direct as possible, so as to avoid high velocity and consequent pipe friction.

The "BUFFALO" line includes

STEAM PUMPS
VACUUM PUMPS
CONDENSERS
POWER PUMPS
CENTRIFUGAL PUMPS

"BUFFALO" pumps are used extensively for

Acid Plants
Bilge and Drainage
Boiler Feeding
Chemical Plants
General Water Supply
Heating Systems
Irrigation Projects
Marine Service
Mine Drainage
Pulp and Paper Mills
Reclamation Projects
Sewage Disposal

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POSTED ON: SEPTEMBER 27, 2016
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